**GENERAL GREG MARTIN**
**Air Force Association Space Symposium**
**Los Angeles, California**
**21 November 2003**

**General Martin:** Thank you very much [Pito] and Chief and Mr. Secretary. It's great to be here. I am in awe of the people that are on the second row that are watching the guys on the front row to make sure we don't screw this up. The Eagles are our heroes — I am honored to be here today with you.

I'm also honored to be here with the Air Force's future. It's terrific that the Air Command, Staff College and ROTC cadets are here. You represent our great hope in the future for where we're going in the 21st Century with the world's greatest air and space force.

Last, let me just say that I have great respect and admiration for the industry partners that we have here.

I'm at Wright-Patterson Air Force Base, Dayton, Ohio where the people that we're talking about today started — where they earned their wings. They built the wings and they earned their wings. And as you look at that incredible center of intellectual and aerospace excellence that we've enjoyed in our Air Force and that we've benefited from for all these years. We have the Air Force Institute of Technology there; we have five of the ten directorates for the Air Force Research Lab; and of course we have the majority of the airframe system program offices. You can't help but wonder what the hell I'm doing there. [Laughter]

As you heard from [Pito's] introduction, I like to think of myself as a guy that's got the discipline of somebody from Citadel, the focus of somebody from the Virginia Military Institute, the prestige of somebody from the Air Force Academy, and the brains of somebody from A&M University. [Laughter]

But I think about that — and I'm out here now. If you go back in aviation history and take a look at what this part of America has done for air, space, electronics, radars, and probably the most significant enabler and endeavor that we're pursuing — the connection of all of this into actionable knowledge as you find in places from San Diego, to Boeing, and centered in California.

You can't help but be amazed at this partnership we have benefited from as we watch the leaders that brought us through World War II, visualize what that future should be, center it in places like Dayton and El Segundo and here in Los Angeles, and you see that really our roots and the seeds of our progress were sewn here. It is to many of the people in this audience that we own a great deal of gratitude to.

So I'm delighted to be here to talk a little bit about some perspectives I have — first from the experiences I had as I grew up in the Air Force, and then with the job that I have right now.

The things that I think our future science and technology, and our future developmental planning efforts need to pursue so that we can continue to do the things that the Chief has talked about and that Lance, of course, is dedicated to pursuing in the months and years ahead.

This is kind of the way I look at the problem.

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Many of you may have seen this slide before, but I want to take it into the job that I'm doing right now — that's the business of trying to look at science and technology and trying to understand the paths that will yield benefits to the concepts of operational needs that ultimately result in capability deficiencies that we try to solve.

We're about the business of getting somewhere — any where on the face of the earth — to be able to not only put the cursor on the target but to do something about it, whether it be as General Lord just described, just the power of the helping hand. To be able to do what we want to do precisely, These aren't exactly in order but I've got them arraigned on the screen in terms of green to red because it sort of gives you an idea — if you will — a rating scale of where we are.

The [inaudible] we need to do and to have enough knowledge about that to be able to make a reasonable decision, and then to do something about it in time. Those are the properties that we're dealing with and should perhaps think about as we listen to the Chief's vision, and we listen to the kinds of things that our space forces are working on every day, as are our air forces as well.

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Then we take a look at that. What are our challenges? We have a difficult time finding all of the concealed targets that we'd like. We're working on that with multi- and hyper-spectral sensors. We're working on that with fusing devices. We're working on that with digital visual communications. But deep down inside there are places people hide things and we can't find them. You know we're having that problem today as we search in Iraq. We know they're there. We're just not sure of where they went.

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Then they're disbursed — again — the problem we're dealing with today. But now when you're dealing with forces that are actually bringing about results that you cannot tolerate and they're disbursed, they're concealed, they're in amongst the crowd. How do you ferret them out? How do you know the difference between this one and that one, and perhaps have a method of doing something about it without unacceptable collateral damage.

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Then there are those that are mobile. Once you maybe figure out where they are, they move on you. And more important

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- the fleeting opportunity which is perhaps a target of great significance, perhaps a SCUD with weapons of mass destruction that can move on you quickly and you have a very narrow window of opportunity. These are what I think are the challenges that we need to focus on if we're going to bring about the kinds of things that our Chief's asked us to do.

How do we get at this problem?

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I think first of all we take a look at the concealed and at the dispersed problem. What we're really working on day in and day out is trying to figure out a way to have sensor persistence.

Sensor persistence. Think about that for a second. You can have it with something that's there all the time or you can have it with lots of things that are coming over a spot of the earth you're interested in and communicating and coordinating with one another. So -

**Q:** [Inaudible]

**General Martin:** It's a system that is, though, able to focus on an area and give you near full time coverage of it. A degree and resolution that is of use and of meaning to you.

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Then because some of those targets move, because some of those targets are important and won't be there long, you have to have a responsiveness to your system. You have to be able to understand not only what's of value and what isn't, but you have to get it up the line and make sure that the right decisions can be made quickly.

Then you have to have systems that can do something about it before that target is gone.

We heard a story earlier today about the fact that within 12 minutes we were able to deliver weapons on a facility that we thought perhaps Saddam Hussein and some of his cronies were in. I'm not sure how long they were actually in there. It doesn't look like they were there when we turned that restaurant area into Crater Vic's - [Laughter] - so we think he maybe didn't stay there long enough. So responsiveness is very very important.

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When you take a look at that, it gets to a concept that General Jumper defined while he was Air Combat Commander and is really a step you must have if you're going to get to the cursor on target that he talks about. It's a concept of predictive battle space awareness. What is that exactly? What does it take to get that?

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Again, remember the mind of an aggy here. I have to have things big to small, black and white, and very simple. If you define it to the nth degree you will sometimes find that it doesn't mean what you want it to mean to others, so let me give it to you this way.

It's really the ability to understand the battle space and the characteristics of it in such a way that you can detect and identify objects of interest, understand where they came from, and predict their likely courses of action. Now think about that for a second.

To have that kind of sense of persistence we're talking about, to have that kind of fusion of information so that you can understand just about everything that's out there — sort out good from bad, sort out quick from slow, sort out those things that are stationary from mobile and fleeting. Then you need to be able to understand where the "friendlies" are, and where the enemy is. Ultimately you need to be able to predict while something is going to respond to it, what the enemy is likely to do, or what that movement or group of people or the area of interest is likely to be by the time a weapon gets there. The ability to — with good definition — determine what the environment will be like when the act is actually occurring. Those are the characteristics that we're looking at.

What does it take to get that?

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I think when you do that, by the way, you're using (as the Chief said) the sensors to do something that we hadn't thought of when we designed them. We thought of them in the mode of discovering or finding things, but now what you're doing is you're using them to confirm what you think might happen and be able to take actions before an event occurs that perhaps you don't want. That happens.

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First you have to have integrated sensors. You remember what the Chief said about let the digits sort it out. Today what we have is an amazing technical capability that's stovepiping systems. If you get all 21 tubes in the room and you can scan them fast and you have a great brain, you can perhaps put together a coherent picture.

Now we've got some systems that are beginning to merge together, but actually what you'd really like is the sensors that have the algorithms and the programs to where they cue one another. And when this one picks up something that it knows is of interest to you, it immediately cues two other sensors to go in and look from a different angle. At that point you get a triangulation and give yourself something of significance. Now you present a [color] on the screen of the object you're looking for that tells you something about it you wouldn't otherwise know.

In order to do that -

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— you also have to have that whole series of sensors out there that we talked about earlier. It doesn't matter whether they're in air, it doesn't matter whether they're in space, it doesn't even matter if they're on the ground if they've got datalink connectivity and can report things in a way that is meaningful for others to see it. So you've got to have that sensor persistence we talked about and whether it's a stare dwell system or whether it's a combination of many, it doesn't really matter to the person who is trying to make a decision as long as they have confidence that the information being presented to them is useful and can help them to make the right decision. Because you don't get a chance to make a wrong decision very often in the business world.

Remember the GPS weapons that we're bombing with today are not hitting targets. They are hitting coordinates. If the coordinates and the target happen to coincide you're in good shape. If they don't, you miss. If it's the wrong target, you miss. We have to have that information for that decision to even be made.

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In order to do that you've got to have databases that integrate you. We're making progress. We're getting there, but we have a long way to go to have that information can seamlessly move about the battle space in a web-enabled architecture as opposed to a stovepipe interface controlled document oriented system.

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Then you have to have some tools that help you. Remember, we're trying to predict, we're actually trying to determine where the future is likely to be. When the [fan] arrives, when the troops arrive, or when the weapon arrives to destroy, that there's something that we intended to accomplish at that point in time.

The only way you get that is to be able to take that information and run it through a series of models that are based on our knowledge of

typical enemy activities. You get that from after-action reports. You get that from studying the way they maneuver, the way they operate. We've done that for years so that we could predict what we were likely to face when we were engaged with enemy air.

In fact if you think back to our structure, the tactical teams that did nothing but analyze what our enemy systems were likely to be able to do, and then we actually analyzed their operational procedures. Then we built a team called the aggressors who trained to that and brought us those formations and brought us those tactics, techniques and procedures right at our home base. We still have them at Nellis today as they help us during our Red Flag. All of that was designed so you can understand the nature of the enemy and the environment the enemy is operating in, and his or her likely courses of action.

There are some physical characteristics here as well. In other words, if you know there's a SCUD that's on a road and it sits next to a cliff or there's a lake — it's not going to go either way in five minutes. It's going to go down the road somewhere. If you know the strength of the road, you know whether it can get on that dirt road or not, or whether it's going to bog down. If you understand what the weather has been recently you can find out whether you're going to find those guys in the mud or not — whether they're going to be able to move at 20 knots or five knots. All of that helps you understand what's likely to happen when the event occurs that you're trying to pursue.

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Then, of course you take a look at that delimitation business and you put it into a dynamic environment, you get to the point that I'm talking about. You've actually got the knowledge that you need from the way they operate, from the physical characteristics of the terrain they're operating on, and from the movement patterns that they've exhibited in the past. You get that because you're self-cuing off their radio communications, off the fact they just came out of a concealed area and only do that when they're getting ready to launch. All of those things tell you not only what's likely to happen, but when it's likely to happen.

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Then a term that I'd ask you all to think about — it's not in the Webster's dictionary, but think of it this way. This is information efficionology. It's really got two aspects to it. This is a makeup word. It comes from aggy-land, okay? [Laughter]

First, we are working very hard on the next generation communication system and the potential of using laser communication that will give you incredible bandwidth. But folks, it won't be enough. It won't be enough for you. Not at the rate you gobble up data and information.

So the first thing we have to do is think very carefully about what we really want to transmit. What do we need to send, and what do we need not to send? How much do you need to process first? How much do you need to compress? How much do you need to send out? Because even with laser communication, the way we have grown in our desire for data and information, not necessarily useful data and information — but the way we have grown in our desire for it — will swamp that system as well. So we have to think carefully about how best to send the information. We have lots of databases and we have lots of storage capacity. We have a limited amount of bandwidth.

So if you ask yourself every day before you go on your airplane, before we send the system up, where every morning we update every one of our satellites with the latest database of imagery photography, then all you have to do is send the changes. In the JSF program they call that X marks the spot. You only have to send perhaps the X, or to a picture that's already memorized in the guy's database in his airplane, and he calls up that picture and the X shows him exactly where the target is. Sure enough, the cursor is there and there's a target there. It's important that he knew exactly what that target looked like other than the fact that there's a green dot over it meaning that it's a target that can be shot.

So think carefully about how we send information and how much of it we need to send. More is not better.

Next, of course, is the way we display information. This is actually a human engineering effort that we have to spend a lot of time thinking about. This is where I said the business of Central California now is heavily into information management, information access, and information display. The area I would tell you we're lagging behind in is information display.

I have to tell you as you search the net these days, the different search engines are pretty incredible in how fast they get information. Some of them are extraordinary. In the amount of time that it takes us in a normal email on-line hookup to open an attachment, some of these search engines can find — given the name of a topic — in two or three seconds literally hundreds of items dealing with whatever it is you want information on.

Now, what if you were able to put to that information something specific - for instance, if I want to know about wine. But I specifically want to know about wine that won't give me a headache. I also want to know where to buy it, and I want it to be able to have it shipped to me in 20 minutes. It basically boils it down to four selections based on that criteria because there are only four wines that won't give you a headache. And theres only two places you can get it to buy on that date. It gives you that information, as opposed to you scanning literally hundreds of documents to find it on your own.

So it's pretty impressive that you can get those 100 documents. We can do that. The question is what do you do with all those documents? What do you do with all those? What do you do with that analysis?

So the concept of being able to present information in a useful way is very important.

Now let me give you a real example of it and how we, the men and women of the team in this room, and those that work for you back at your home bases and in your industries, or will work for you when you graduate, or will work for you as they come through colleges — you need to think about this.

When I was an F-4 pilot they used to have a gun sight that when you locked on you could get an analog bar that showed you the range to the target. This was really good for both missile application and gun application. There was a switch that would tell you that it was 18,000 feet down to zero; and another one would tell you it was 6,000. You just switched the switch times three. You could then tell how far away that target was by looking at this gun sight, which is a circular retical with a [pipher] in the center, and on the side they would fatten the [inaudible] up and it would show you the distance to the target. Which meant while you were flying in a basic fighter maneuver against an enemy — while you were looking at him and doing your maneuvering — you could see your distance peripherally as you were looking through your heads-up display without having to focus on a specific number or take your eye off the target.

Now the [inaudible] was set up to where one o'clock was 6,000 feet; two o'clock was 5,000, three was 4,000, four was 3,000, five was 2,000, and six was 1,000 feet. When you got down to six o'clock it was where in training we broke off. The Eagles started firing at that range. That was out of range for many of them. These are gutsy guys that built our Air Force for us.

They came out with the F-15 and the engineers were so excited because they had an ability to display this information in digits. They had the gun sight and they would have a little window that would have digits on it that would tell you if you were 6,221 feet, 6,215 feet, 6,200, right on down. So if you would take your eyes off the target for a second and look at that number, then in your mind you could compute the fact that that number was unwinding or going up real fast, you could determine what your closure rate was and you'd know the distance. But you'd miss the target. You had better information, it wasn't useful.

So we asked the engineers, do you think you could just put an analog box? It was probably George [Mizer] who's here today who helped them figure this out. Can you put an analog bar on there because the analog bar gives me what I really need? I don't need to know the exact footage. And by the way, when you do that could you have six at 6,000 feet, five at 5,000, four — and they did. "Sure we can do that.

You want that? You don't want these numbers?" No. I want a bar. "Oh, okay. We can do that."

Now the radar display. You'd drop down to a target and then there'd be a little blip there. When you first see the blip it's out there a certain number of degrees left or right, you know the number of degrees, and you know what the range was. You'd lock to it, get an elevation [inaudible] and it would tell you that it was two degrees, two degrees, ten degrees, whatever the ground was above you or below you.

Now you could compute that and at ten miles two degrees would be 2,000 feet or whatever. And across the top they had a string of numbers they felt were pretty important. They'd have the ground speed of the aircraft; they'd have the G-rate that the aircraft was turning, and they'd have an aspect angle. If you're right in front of me you'd be on my H, or my head. Over here would be 1-7 right, 1-4 right, 0-9 right. Over here would be left. So here I would be in an engagement, of course my wingman's telling me about fuel or sims coming up. I'm sitting here adding these numbers up. I'm looking at that elevation saying okay, it's about — Okay, I'll go back to my computation here. Remember, aggy, right?

So I go back to my computation. I figure out okay, he's 8,000 feet above me; he's out there 20 miles; he's a 1-7 right. Let's see, I'll turn myself around here so — Okay, he's going that way to this way. [Laughter] And [inaudible] up there.

We talked to the engineers and said do you think you could just put an arrow on that target that tells me where he's going? Long arrow, he's going fast; short arrow, he's going slow. Give me an altitude readout. "Oh, no, captain, we don't have enough computer memory space." I said why don't you get rid of the numbers? "Oh, no, we're told you use those numbers." Well, we never use them. "Well, I'm sorry, we're a 16K computer going to 24K and we've already spoken to 36K."

Ten years later we got the arrow. Ten years later. "Oh, we can't do that."

We have to understand this concept of efficionology is not only what you send so that it can get there quickly, it's how you send it, display it, and present it to a decisionmaker who can then make a decision in time that he needs to make. And you can't do it in stovepipes. It has to be integrated. It has to be done by a group of people who care about the sergeants, who care about the objective, not about their part of the problem, but the whole problem and how they fit into it.

That's what our partnership has to do. That's what we have to have on the flight line. That's what they have to have in the [inaudible] control centers, that's what we have to have in the AOCs, and that's

what we have to have at the Air Staff and in industry. We have to understand what we really need to get that job done because the sergeant needs it now. And we can't do it [inaudible] what our next [war] is. We've had five in the last 12 years. They happen all too often, unfortunately, so we have to be ready for the next one today.

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So what are we doing here? If you take a look at the Air Force Research Laboratory — by the way, ten technology directorates of absolutely magnificent Americans led by a great leader, Paul Nielsen — many of you know, are working very hard on nano-technology.

Roll out the next three, please.

These are the kinds of things it will do for you. I think of nano-technology oftentimes as that ability to have motor skills in very-very micro systems. But it also allows you to design materiels and actually do [warping].

Wouldn't it be interesting if we could go back to controlling our aircraft just the way the Wright Brothers did, by walking the wings instead of having control surfaces that move? Because the surfaces can actually do that — and do it in a way that doesn't upset their stealth technology and change their erognamic conditions very much. It's very interesting what you can do [inaudible] materials. Ten to 100 times stronger, and of course movements of systems. And the real value of that is that those can be done with minimum amounts of power. Minimum amounts of power.

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You take a look at the next area that we're looking at. It's not just batteries, although we're talking about batteries as well. If you talk to a Special Operations troop that's on the ground, when the run out of batteries they may not be able to use some of that equipment.

So we can design systems to where the weight's down and we can get the satellite system into space, a lot more of them into a swarming network or into, as the Chief mentioned, micro-satellites that can actually cue off each other. And we've got that power set up in such a way that they can do those kinds of things because of the nano-technology license. They can stay up there longer because as many of you know the limitations of our satellites are oftentimes how much power they have on board to move them around, to do stations and keep them in place.

And the same of course is true now in terms of the very very thin solar panel arrays that produce an incredible amount of power.

And over on the aviation side the idea of the more electric engine that could give you directed energy capability on a tactical platform.

Maybe not having to use a 747 in order to get yourself into a useful and perhaps lethal laser or directed energy capability.

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Propulsion. And as the Chief said — not propulsion for a platform's sake. That may be when you decide that it's a platform you need, but propulsion in general because when you start talking about single staged orbit, when you talk about hypersonics, when you talk about all these different capabilities, all of them will require us to have different and much more capable propulsion systems than we have today.

Now you marry that up with the lighter weight, and with the power technology that gives you much reduced weight and much more sustainability on orbit or in the air. Now you're starting to talk about dwell times, in-space [going] to air that can be significant for this Air Force because you've got to go back to the real job that we're trying to do with this. Sensor persistence, digit-to-digit conversations for the purpose of giving us information and knowledge about the battlespace so we can make decisions instantaneously.

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And then directed energy — speed of light activity. On the move, like we're finding with [inaudible] denial systems and scanning technology. In the air where we're now talking about the potential of combat identification at ranges that no one thought possible before, to the actual perhaps destruction of the systems not only in the air as we're finding with airborne laser, but perhaps in space in years ahead. Speed of light capability.

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And let's not forget this last one — human effectiveness. Because in the end if we don't pay attention to the guys that have to operate it, as I was telling you the F-4 and the F-15 story, will develop things that aren't useful but are very high tech.

Let me give you an example of perhaps one country's approach to this high tech thing. You know down at Brooks City Base in San Antonio we have our Human Systems Wing and they do an awful lot of the human effectiveness activity, as do the folks out of Mesa and of course those at Rome and Wright-Patterson as well.

The commander down there — he's a Texan. When he was born his parents gave him a parrot to be his lifelong friend. Many of you may know that parrots live to be 75 to 80 years old, so my wing commander down there's 50 years old and he's been working on some pretty important state of the art activities with respect to how we will be able to do a better job of determining human effectiveness and human performance, particularly in long, long missions.

There was a conference that he was going to go to in the UK so he took off out of San Antonio. It was a standard San Antonio day, about 95 degrees. It was about 80 percent humidity. He stuck the parrot on his arm and off they go. He had to stop at Gander, Newfoundland to get some gas. Of course it was a standard day at Gander — 35 knots of wind, 10 below zero, six inches of snow. So he gets out of the airplane to go into the lounge and the bird, as he walks off the steps shivers a little bit, stiffens up, and falls over and hits the tarmac.

This is a tragic event. The wing commander's 50 years old, his bird's 50 years old, lifelong friends. He's just beside himself. He goes inside and says this is awful. These birds are supposed to live until they're 75 or 80 years old. Is there anything you can do? Is there a vet? Sure, sure. We have the highest tech veterinary capability that we're aware of anywhere in Newfoundland.

So off they go down to the hospital and take him into the veterinary clinic. The vet takes a look at the bird, says "the bird's dead, that will $25." The commander says come on, you must have some other techniques that you can use, that you can scan to determine whether you can resuscitate him. He's supposed to live to be 75 or 80 years old I've had this bird since I was a baby.

The guy says "well, okay, I'll try a couple of techniques." He brings his Labrador Retriever in and the retriever sniffs at him, picks him up. The head goes down like this. He shakes him a little bit and drops him down on the floor. The dog looks up at his master and shakes his head and he said, "Sir, the bird is dead."

The guy says come on, you've got to have better techniques. So they bring a cat in. The cat paws at it a little while, it's like a ball of yarn; plays with it. The bird is still limp and doesn't move. The cat looks up at his master and shakes his head. The guy says "that's three opinions you've had now. The bird's dead and that's $125."

He goes $125. I've been here less than five minutes. How is that? He said well, the first $25 for me, $50 for the lab work, $50 for the cat scan. $125. [Laughter]

Now in some places in the world there has not been a patent issued since 1899. Human effectiveness is very potent and we have to understand an awful lot about how we make our decisions so that you can then do the displays necessary. We have to understand what the loads are, what the stresses are, what causes you to make decisions on one day differently than we do on another day. Then be able to apply that into the technology we're talking about, particularly when it comes to hitting targets in an area where collateral damage may be unacceptable. What can you do and what can you not do, and what system can you get there in time?

So if you take a look then at that continuum, the range, precision,

knowledge, decision and action, and you take a look about what we're trying to do and you listen to what General Lord said and what the Chief said a few moments ago, these are my thoughts on what we're trying to do in the days ahead.

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We want to have battle space awareness at the touch of a screen. We don't want to be looking at 21 screens. You want to be able to look at a screen and be able to call up exactly what you want and be able to look at it with a touch.

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You want to be able to have that real-time information that's useful to a decisionmaker so that —

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— ultimately he can achieve the desired effects near instantaneously. When you do that, —

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— you've got the knowledge, you've got the ability to make that decision, and you've got the ability to take the action in time, and you'll do something that really is what this whole business is all about. When it comes to that pursingof the target and taking action, if you think back to 1947 when we broke the sound barrier, what we're after in this business now —

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— is to break the time barrier. That is our limitation. That is where we're going. That's where this air and space force is. And every day we've got to think about what the Chief said with respect to the story that he tells of his visit to Lackland. I offer you this thought, and it is particularly meaningful as I sit here today as a commander of one of our major commands [inaudible] the people who built this Air Force, who gave us the opportunities that we have today, and gave us the vision and the foundation of our Air Force. And I know as I say this I'm here in the shadows of General Les Lyles and General Randy Randolph who sat in my chair or a systems command chair before I got here.

I think about a story where at the end of Enduring Freedom I saw a multimedia presentation that was being given by a band and a singing group, it was an Air Force band. And they had screens much like you have here. And the pictures that came up about every three to five seconds with this very patriotic music were pictures of our force, most of them our enlisted force, doing the job of the Air Force in Operation Enduring Freedom.

There was a guy loading a JDAM onto an aircraft. There was a guy on a radar scope in the back end of an AWACS. There was a guy in the control tower. There was a Special Forces guy on the ground calling in an airstrike. There was a security forces guy guarding a gate. There were a couple of pilots. There were some of our other crew chiefs that were changing tires or changing engines. There was somebody there in a lab that was watching after-burner accelerations in one of our emerging engines. And I thought to myself as the commander at that time, and certainly today as I stand before this group of Eagles, the people that I have great admiration and respect for. I thought to myself, am I worthy of the charge given to me to lead people in this incredible organization we have? Am I worthy?

So I ask myself that every morning. Am I worthy of what my seniors expect of me? Am I worthy of those people that went before? But most important, am I worthy of the charge given to me to lead and command this nation's greatest resource, its young men and women whose mothers and fathers give them to us to serve, to be better when they finish, and to have made a difference in our nation?

Ask yourself that question. Then guide yourself every day by that question.

It's a pleasure to be here. I salute all of you for what you do for our nation. I'm very proud to serve in our Air Force. I'm proud to serve with you whether you're wearing the uniform, whether you're one of our great Air Force civilians, or whether you're our industry partners, or whether you're getting ready to come into our Air Force. God bless you all, and God bless America.

Thank you.

[Applause]

**Q:** Thank you, General Martin.

The first question is related to spiral development. It says with the complicated task of integrating the information medium, do you see spiral development as a help or a hindrance?

**General Martin:** Spiral development is a fact. I don't think we have any choice. Let me put it another way. It is not only fact, it is actually essential if we're going to be able to maintain our edge in the kinds of capabilities that are demanded of us every day. But we have to approach it from the right perspective.

Let me give you the example of probably the most successful spiral and continuing spiral development process we have. It's the operational flight programs that we program all of our modern aircraft with on a regular schedule. We had that down at one time to just over a year. It's crept back up to three years and been brought back down to

somewhere between 18 months and two years.

But what that really means is that we have the capability with our radars, with our fire control systems, with our antennas, with our communications and datalinks — we have the capability to improve the performance of those systems as they exist in a hardware state by changing the software. All you have to do is get those people together to say "gee, can you get rid of the digits and give me an arrow?" Then you have to have a little bit of money and you have to have somebody that's focused on it. And overall our changes to F-15s, F-16s, F-117s, C-17s, the operational fight profile, [inaudible] schedule they're on allows us to continually spiral the capabilities of our aircraft in a way that is I think very appropriate.

So it's a fact. It's essential. Now let's talk about in terms of hardware development. The way that you do that of course is you have to change the nature of the infrastructure that is used to producing systems in a set-piece patterned way. That it takes the hundred percent solution before you're willing to accept the article at the end of it.

Remember, the process that I just described to you said that the Predator is not operationally effective or operationally suitable. That's what the process said. Ouch.

If you've got a system that says it's no good and you've got people out there that want it to the point where we can't even stand the squadron up and give them any stability because they're gone all the time. And not only that, we're adding things to it at a rate that makes them even more effective. The system back here is archaic. It needs to be fixed.

We need to understand a better way to determine how to evaluate and assess not only the requirements we develop or the capabilities as we call them now, but also the method by which we kept them and accept a level other than 100 percent knowing that the 80 percent level is actually giving you meaningful and important capability.

And then that 20 percent is the next area you work on. And when it comes to the logistics and sustainment and all that, you also structure yourself to take care of at least the 80 percent piece.

So my view is it's a fact that we knew and now we have to change the process to allow it to occur in a much more timely and responsive fashion.

**Q:** Thank you, sir.

Today our Air Force industry is made up of large corporations, much fewer than we had in previous years. And of course supported by many third and fourth tier subcontractors. How would you assess our industrial capability in aerospace today?

**General Martin:** That's a very challenging question because on any given day one of our major programs being produced by one of our major merged airspace corporations could have a failure, could have a problem, could have a setback because we are dealing with the most sophisticated technology.

I think the first question you have to ask yourself to make sure that you don't get yourself too far away from reality is to say how are we doing with respect to the rest of the world? Then you can say okay, Is there anybody close? So how can we make what we're doing better?

What I would tell you is that it's probably, as both General Lord and General Jumper talked about, in integration. And actually when you take a look at these large aerospace corporations that we have now who have gobbled up many of the smaller ones, you'll find that they have an unprecedented ability to do integration across a whole series of technologies that are now all important to every one of our aircraft.

When we were developing aircraft at two-year clips in the late '40s and '50s, we were going after certain characteristics and there were other things that we didn't really worry a lot about. We may have been going after range, we may have been going after speed, we may have been going after a gun system. The way that OFP worked is if it didn't fit on this one because [inaudible], we could put it on the next one because it's two years later when we build another airplane.

If you take a look at the aircraft that we were building in the late '50s to early '60s, the growth from the F-36 days all the way up to and through the F-111, you see the numbers of aircraft we produced in that 15-year period. You can see that we didn't spend nearly as much time on worrying about all the subsystems. We worried about some of the main characteristics that we wanted in that system.

Today we're doing integration capabilities and giving these platforms capabilities across a whole spectrum of missions because the technology allows us to do that in a way that we've never done it before.

What's important to realize, though, is it ain't easy. If it was easy, everyone would be having that kind of success, and no one is having the success that our systems have.

There are bad days. What we have to do is figure out how to minimize the bad days and push this team forward just as it has done throughout our history. It's a great team. We need to always remind ourselves of that. Then work on what I consider to be the seams and the pulls and separations that keep us from being integrated and successful as often as we need them to be and we want them to be.

**Q:** Thank you.
Finally, we talk a lot about integrating our capabilities on the

battlefield. That's largely dependent on our ability to develop and enforce standards for joint forces. how do you see that coming along?

**General Martin:** There is an important question. I like to not think of the term joint like we teach in PME and all. I really wish we would think more about integration. I think we saw that done in an unprecedented way in Operation Iraqi Freedom. Because just as you heard during the sandstorm, when all of the people that were on television were saying we undersized the force, we brought it down, we couldn't supply it, because they were looking at the battlespace through one embedded journalist's view or maybe five views.

Then we were hearing that the progress had stopped. But the fact was, as General Moseley said, we're not softening them up, we're killing them, and they moved into Baghdad within a week. That happened because there were professional and personal relationships made at the senior level.

General Moseley and General McKiernan and Admiral Keating and General Harrell and of course General Franks all worked for well over a year to understand each other's limitations, to understand each other's strengths. To exercise and to game it and to work it. They were able to chew off of one another in a way that perhaps we'd never seen before. They were able to support one another with integrated combat power like we have never seen.

So now let's take the lessons of that and say what would make that integration occur seamlessly and automatically without necessarily having to have some personalities that not only work together well professionally, but they actually liked each other. How about that one? Friends will do anything for friends.

Now let's make the system and the infrastructure allow that to happen all he way down to the foxhole.

So I'm very high on the concept of integration. I'm very high on the concept of making sure we have standards and systems that do communicate and pass information, because frankly I don't care if it's an Air Force space system, an NRO space system, a Navy airborne system, an Army trooper on the ground that gives me the last piece of information that puts the cursor over the target. It won't happen if they aren't integrated, so I'm absolutely dedicated to that.

**Q:** Sir, thank you very much for not only giving us the challenges there about what we need to do in the future to keep our great industrial partnerships, our services going to create the forces we have and we're so proud of today, but also thank you for the challenges you give us on leadership examples.

**General Martin:** It's great to be here. Thank you.

(END)